IN THE CLAIMS:

Please cancel claims 1 - 4

Please add new claims 5 – 11 as follows:

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5. (New) A partial rotation torque motor comprising a rotable shaft supported by ceramic ball bearing assemblies, said bearing assemblies supported by a bearing support structure, said shaft and said bearing support structure having the same coefficient of thermal expansion as said ceramic bearing assemblies.

6. (New) A partial rotation torque motor according to claim 5, each said ceramic bearing assemblies comprising a ceramic inner race, ceramic bearing balls, and a ceramic outer race.

7. (New) A partial rotation torque motor according to claim 5, said shaft and said bearing support structure fabricated of nickel-iron alloy.

8. (New) A partial rotation torque motor according to claim 5, said shaft being electrically isolated from said bearing support structure.

9. (New) A partial rotation torque motor for use in a galvanometer scanner, comprising a rotable shaft supported by at least two ceramic ball bearing assemblies, said bearing assemblies supported by a bearing support structure, said shaft and said bearing support structure fabricated of nickel-iron alloy, each said ceramic bearing assemblies comprising a ceramic inner race, ceramic bearing balls, and a ceramic outer race, said shaft and said bearing support structure having the same coefficient of thermal expansion as said ceramic bearing assemblies, said shaft being electrically isolated from said bearing support structure.

10. (New) A partial-rotation torque motor comprising

a reversibly rotable shaft rotationally restricted to less than one full turn, and

a2 cncld.

a stator and housing assembly within which said shaft is located, said shaft supported by all ceramic ball bearing assemblies, each said assembly including a ceramic inner race mounted on said rotable shaft and a ceramic outer race mounted in said housing and multiple ceramic bearing balls interspersed there between, said shaft said stator and said housing assembly fabricated of a nickel-iron alloy of matched thermal expansion to said ceramic bearing assemblies, said shaft being electrically isolated from said stator and said housing.

11. (New) A partial-rotation torque motor according to claim 10, for use in a galvanometer scanner.

REMARKS:

Summarizing the invention, there is a high speed, high precision, partial rotation, torque motor, a galvanometer scanner in particular, where the interface between rotating and fixed components is comprised of components including a high precision bearing assembly, having matched thermal characteristics so as to avoid stresses on a high precision bearing assembly which has a very hard bearing/raceway interface for high speed, long life, partial rotation operation, and is non-conductive electrically so as to provide electrical isolation between rotating and fixed components. The invention as a whole provides very precise, persistent, axial alignment in a high speed, partial rotation environment, as well as electrical isolation between the stator and rotor. It is a novel combination of features and application, the sum of which comprises the claimed invention, as herein amended.

Summarizing the cited Office correspondence, claims 1-4 are rejected. Claim 1 is rejected under 35 USC 103(a) as to Brill in view of Stangeland. Brill is alleged to disclose stator and rotor components fabricated of nickel-iron alloy and having a predetermined coefficient of thermal expansion. The Office admits that Brill does not disclose bearings of equal coefficient of thermal expansion. Stangeland is alleged to disclose a rotary device with bearings having the same coefficient of thermal expansion as the shaft and stator, for bearing longevity and wear resistance.

Claims 2-4 are rejected under 35 USC 103(a) as to Brill, in view of Stangeland and Watanabe. Watanabe is alleged to disclose electrical isolation of the stator and housing, and the purpose of improving dimensional accuracy while avoiding brittleness of the ceramic material.

Applicant has herein cancelled claims 1 - 4 and added new claims 5 - 11. For the purpose of the 35 USC 103 discussion that follows, the elements of claims 5 through 11 are substantially those of the prior claims, recast for clarity. Claim 5 equates to claim 1. Claim 10 equates to claim 3. In addition, the preamble of claim 5 further qualifies and limits the claim 1 invention as a whole to a partial rotation torque motor, which sharpens the distinction between Stangeland and Watanabe references and the invention. The minor amendment in the specification merely corrects a typo.

The claims rejections in the Office correspondence are 35 USC 103 obviousness rejections, for which Office policy is to follow the *Graham v. Jone Deere Co.* four factual inquiries for determining obviousness; (A) determining the scope and contents of the prior art; (B) Ascertaining the differences between the prior art and the claims in issue; (C) Resolving the level of ordinary skill in the pertinent art; and (D) Evaluating evidence of secondary considerations. Of course, the references must be viewed without the benefit of impermissible hindsight vision afforded by the claimed invention; *Hodosh v. Block Drug Co. Inc.* 786 F.2d 1136 (Fed. Cir. 1986).

Brill is a 1981 patent, disclosing a design for a galvanometer-type motor, the type of device to which this invention applies. However, the scope and content of Brill does not reach the problem addressed by this Applicant, or the solution offered by way of the claimed invention. Nowhere does Brill recognize or discuss the bearings or the thermal expansion properties or problems with his selection of materials. At Col. 3, lines 45-50 there is a reference to using a nickel-iron alloy, but this is irrelevant as it is qualified as selected for its high permeability and low hysterisis, electrical properties of interest to Brill, not structural properties associated with bearing performance or thermal expansion. The reference is rendered further irrelevant as pertaining only to the stator laminations, making it impossible to construe as relating to

improving the resistance of the structural and axial alignment to temperature variations or to having any effect on bearing performance. There is in fact no specific reference to bearings, or to electrical properties, service life, or expansion problems relating to bearings, or to the axial alignment and rotational capability which bearings provide. Brill is an unlikely focal point or candidate specimen to resolve the issues addressed by this Applicant's invention. While it may arguably be in the general field of the invention and illustrative of a galvanometer design, it is clearly not pertinent to or even cognizant of the particular problem with which the invention is concerned; *Wang Laboratories Inc. v. Toshiba Corp.*, 993 F.2d 858, (Fed. Cir. 1993).

The Stangeland 1992 disclosure of functionally gradated *bearing races* is apparently directed to machinery operating dry or in the presence of cryogenic propellants. Again, the scope and content fails to reach the subject matter of this Applicant's disclosure. There is no hint about the special characteristics of galvanometer-type motors, including partial rotation, high speeds, precision alignment, and electrical isolation at issue in this applicant's disclosure. The materials description of the Stangeland bearing races is an intentional gradual variation of metal to metal-ceramic raceway materials in a component of a bearing. The supporting structure can only be presumed to be conventional, and the composition of bearing balls with which it must operate is not discussed. While the Stangeland invention resides as a feature within a component of a bearing assembly, the difference in function between this feature of a bearing raceway and the instant invention as a whole is entitled to great weight; *In re Ellis,* 476 F.2d 1370 (CCPA 1973).

Expanding on this point, there are no special needs for critical alignment, and no electrical or rotational speed characteristics at issue relating to the Stangeland application. Neither the invention nor the application is suggestive of this applicant's galvanometer-type motor, with rotor, stator and bearing structures having uniform thermal expansion characteristics and the all-ceramic bearing assembly providing a suitable rolling contact interface for high speed partial rotation with very close tolerances. Indeed, galvanometer scanners today are sophisticated devices, *not* "common everyday mechanisms", the problems of which may be susceptible of improvements coming from a "broad spectrum of prior art"; *Stevenson v. International Trade Comm.*, 612 F.2d 546 (CCPA 1979).

The above comments support the Applicant's position that neither Brill nor Stangeland nor the combination obviates the claimed invention. Neither reference is even a likely *source* of a solution for the problem being addressed. It is not whether the individual differences themselves would have been obvious, but whether the claimed invention *as a whole* would have been obvious; *Stratoflex, Inc.v. Aeroquip Corp.* 713 F.2d 782, Fed. Cir. 1983). Based on these remarks, Applicant respectfully requests reconsideration of its new claims 5 - 11.

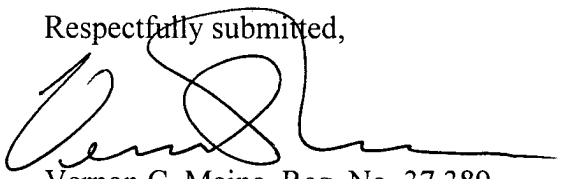
Watanabe et al., discloses an insulated bearing assembly, the outer metal raceway of which has a non-conductive film of polymer elastic material sandwiched between it and a further outer metal cap that is the contact surface for the supporting structure. It surely does offer electrical isolation of the rotor from the support structure, but it is not a viable solution or even a useful start to the problem addressed by this Applicant's claimed invention. Adding two more layers to the bearing assembly is highly unlikely to improve upon its inherent limits of precision of axial alignment. The disclosure admits to the dimensional distortion introduced by a layer of film, as at col. 2, line 15, and line 67, for example, and to its elasticity, as at col 3, line 10, further degrading the potential for close tolerances and precise alignment in operation. Applicant's claimed invention does have a functionally equivalent feature to the electrical isolation of Watanabe, but the feature is embodied very differently in a bearing assembly of minimal components, all components fabricated of the same non-conductive material, and further comprises only an element of the claimed invention. "It is the invention as a whole, and not some part of it, which must be obvious under 35 USC. 103." *In re Antonie,* 559 F.2d 618 (CCPA 1977).

In sum, the bare idea of insulating the rotor from its support structure is not claimed to be new, by either the Applicant or Watanabe, and Watanabe's embodiment is not suitable for this Applicant's purpose. Watanabe is not a useful combinant to other art as a means to obviate the instant invention. Applicant therefore respectfully requests reconsideration of its new claims 5 - 11.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached page is captioned **"Version with markings to show changes made."**

Applicant believes the above amendments, new claims, and remarks to be fully responsive to the Office Action, thereby placing this application in condition for allowance. No new matter is added. Applicant requests speedy reconsideration, and further requests that Examiner contact its attorney by telephone, facsimile, or email for quickest resolution, if there are any remaining issues.

Respectfully submitted,



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